THE NATURALIST.

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THE FIG TREE.

The fig tree is evidently a native of that part of Asia, where the garden of Eden is generally said to have been situated, as it is the only tree particularly named in those passages of the Bible, which relate to the creation and fall of man. '*And they sewed fig leaves together and made themselves aprons.*' It is a fruit that appears to have been highly esteemed by the Israelites, who brought figs out of the land of Canaan, when they were sent by Moses to ascertain the produce of that country.

The fig tree is often mentioned both in the Old and the New Testament, in a manner to induce us to conclude that it formed a principal part of the food of the Syrian nation. In the twenty-fifth chapter of the first book of Samuel, we read, that when Abagail went to meet David, to appease him for the affront given by Nabal her husband, she took with her, among other provisions, a present of two hundred cakes of figs.

When Lycurgus banished luxury from Sparta, and obliged the Spartan men to dine in one common hall, to enforce the practice of temperance and sobriety, every one was obliged to send thither his provisions monthly, which consisted of about one bushel of flour, eight measures of wine, five pounds of cheese and two pounds and a half of figs.

The Athenians were so choice of their figs, that it was forbidden to export them out of Attica. Those who gave information of this fruit being sold contrary to law, were called *sykophantai*, from two Greek words signifying the discoverers of figs; and as they sometimes gave malicious information, the term was afterwards applied to all informers, parasites, liars, flatterers, imposters &c., from whence the word *sycophant* is derived.

The story of Romulus and Remus being suckled by a wolf under a fig tree, proves that this fruit must have been early known in Italy.

The Egyptians and Greeks held this fruit in great estimation; it was their custom to carry a basket of figs next to the vessel of wine used in the *Dionysia*, or festivals in honor of Bacchus; and it is related to have been the favorite fruit of Cleopatra, who was the most luxurious queen the world ever produced. The asp with which she terminated her life, was conveyed to her in a basket of figs.

Saturn, one of the Roman deities, was represented crowned with new figs; he being supposed to have first taught the use of agriculture in Italy. There was a temple in Rome dedicated to this god, before which, grew a large fig tree. The vestals, when they removed this tree in order to build a chapel on the spot, offered a propitiatory sacrifice; this happened about 268 years after the foundation of the city.

The fig was a fruit much admired by the Romans, who brought it from most of the countries they conquered, and had so increased the varieties in Italy, by the commencement of the christian era, that Pliny has furnished us with a description of twenty-nine sorts that were familiar to him. He says, 'figs are restorative, and the best food that can be taken by those who are brought low by long sickness and are on the recovery.' He adds, 'that figs increase the strength of young people, preserve the elderly in better health and make them look younger and with fewer wrinkles. They are so nutritive as to cause corpulency and strength ; for this cause,' continues he, 'professed wrestlers and champions were in times past fed with figs.' This naturalist mentions the African figs as being admired; but says, 'it is not long since they began to grow figs in Africa.' These appear to have been of an early kind; for we find when Cato wished to stimulate the senators to declare war against Carthage, he took an early African fig in his hand, and then addressing the assembly, he said, 'I would demand of you how long it is since this fig was gathered from the tree?' and when they all agreed that it was freshly gathered, 'yes,' answered Cato, 'it is not yet three days since this fig was gathered at Carthage; and by it, see how near to the walls of our city we have a mortal enemy.' With this argument he prevailed upon them to begin the third Punic war, in which Carthage, that had so long been a rival to Rome, was utterly destroyed. 'The Lydian figs,' says Pliny, 'are of a reddish-purple color; the Rhodian, of a blackish hue; as is the Tiburtine, which ripens before others. The white figs were from Herculaneum, Albicerate and

Aratian; the Chelidonian figs are the latest, and ripen against the winter; some bear twice a year, and some of the Chalcidian kind bear three times a year.' The Romans had figs from Chalcis and Chios, and many of their varieties, it appears, were named from those who first introduced or cultivated them in Italy. The Livian fig was so named after Livia, wife to the emperor, Augustus, who, it is said, made an unnatural use of it to poison her husband.

The fig tree is a low shrub naturalized in Italy and the south of France, and enduring the open air in the mildest parts of Britain and the United States. This tree, in France and Italy, grows as large as our apple trees, but in England and this country seldom exceeds two yards in height; the trunk is about the thickness of a human arm; the wood is porous and spongy; the bark ash-colored; the branches smooth with oblong white dots; the leaves annual in the temperate zones, but perennial within the tropics, cordate, ovate, three or five lobed, thick, and the size of the hand. The fruit is a berry, turbinate, and hollow within; produced chiefly on the upper part of the shoots of the former year, in the axils of the leaves, on small, round peduncles. The flowers are produced within the fruit; what is considered as the fruit being a common calyx or receptacle; the male flowers are few, and inserted near the opening in the extremity of the receptacle, or fruit; the female flowers are very numerous, and fill the rest of the hollow space within. The greater part prove abortive, both with and without the process of *caprification*. The fig tree is distinguished from all other trees, with which we are acquainted, by its bearing two successive and distinct crops of fruit in the same year, each crop being produced on a distinct set of shoots; but this climate rarely allows the second crop to come to maturity, except where they are forced by hot-house culture.

The *caprification* of figs was practised by the ancients in the same manner as it is now attended to by the inhabitants of the Archipelago; and it is described by Theophrastus, Plutarch, Pliny and other authors of antiquity. It is too curious a circumstance in the history of the fig tree to be omitted, as it furnishes a convincing proof of the reality of the sexes of plants. In the cultivated fig, the receptacles are found to contain only female flowers, that are fecundated by means of a kind of gnat (*culex L.*) bred in the fruit of the wild fig trees, which pierces that of the cultivated, in order to deposit its eggs within, at the same time diffusing within the receptacle the farina of the male flowers; within this operation, the fruit may ripen, but no effective seeds are produced. Hence it is, that we can raise no fig trees from the fruit of our gardens, having no wild figs to assist the seed.

They are consequently raised by cuttings, layers, suckers, roots, and by ingrafting; the most general method is by layers or cuttings which come into bearing the second, and even the first year.

In many parts of the Grecian Islands, the inhabitants pay such attention to the caprification of the cultivated figs, that they attend daily for three months in the year to gather these little flies from the wild fig trees in their gardens, by which means they not only get finer fruit, but from ten to twelve times the quantity; thus one of the most minute insects is, by the attention of man, made a principal cultivator of fruit.

It is a curious fact, that freshly-killed venison, or any other animal food, being hung up in a fig tree for a single night, will become as tender, and as ready for dressing, as if kept for many days or weeks in the common manner. We are told of a gentleman, who made the experiment of suspending a haunch of venison which had lately been killed, in a fig tree when it was in full foliage, at about 10 o'clock in the evening, and was removed in the morning before sunrise, when it was found in a perfect state for cooking; and he adds, that in a few hours more, it would have been in a state of putrefaction.

We import the best dried figs from Turkey, Italy, Spain and Provence. In the south of France, they are prepared by dipping them in scalding-hot lie, made of the ashes of the fig tree, and then dried in the sun.

The most suitable kind to raise in Great Britain or the northern part of the United States, is the Brunswick fig, (*Ficus indica.*) Plate 6. In a south-east corner, trained against a wall, it ripens in England by the middle of August, and about a month later in New England. It is necessary however, in this country, to secure it from the frosts during the winter, and to remove it as early in the spring as the season will admit. The leaves are very deeply five lobed, the lobes narrow, and of nearly equal width. The fruit is very large, obovate, fleshy, with an unusually oblique apex. The eye is rather depressed. The stalk short and thick. The skin pale green on the shaded side with a tinge of yellow; next the sun, dull, brownish red, sprinkled with small pale brown specks. The flesh is pinkish in the interior, nearly white towards the skin, but chiefly semi-transparent reddish brown, extremely rich, sweet and highly flavored.

The fig is cultivated in Great Britain and in this country entirely for the dessert, but in fig countries, it is eaten green or dried, fried or stewed, and in various ways, with, or without bread or meat, as food. Abroad the fig is introduced during dinner, as well as at the dessert. In common with the melon, it is present-

ed after soup; and the person who cuts a fig, holds it by the small end, takes a thin circular slice off the large end, and then peels down the thick skin of the fruit in flakes, making a single *bonne bouche* of the soft interior part.

For medical purposes, figs are chiefly used in emollient cataplasms, and pectorial decoctions.

The wood of the fig tree is of a spongy texture, and, when charged with oil and emery, is much used in France by locksmiths, gun smiths and other artificers in iron and steel, to polish their work. This wood is considered almost indestructible, and on that account was formerly used in Egypt and other Eastern Countries, for embalming bodies. The milky sap of this tree may be used as rennet, and for destroying warts.

We shall conclude our account of the fig tree by the well-known story of Timon of Athens, who was called *Misanthrope*, for his aversion to mankind and to all society. He once went into the public place, where his appearance as an orator, soon collected a large assembly, when he addressed his countrymen by informing them that he had a fig tree in his garden, on which many of the citizens had ended their lives with a halter; and that, as he was going to cut it down, he advised all those that were inclined to leave the world to hasten to his garden and hang themselves.

CONCHOLOGY.

NO. IV.

Of the Colors of Shells. The infinite variety of the colors of shells is one of the most striking parts of their history; and it becomes a curious and interesting object of investigation to inquire whether these colors are uniform and constant in the spires, and from what proceeds this regularity and uniformity. The experiments and observations of Reaumur will assist us in this investigation. When a hole is made in a shell, nearly at an equal distance between its tip and opening, the new piece of shell which is formed to shut up the hole, is usually of a white, and often very different from that of the rest of the shell. It would appear at first that the new piece is of a different nature, and that it is not formed in the same way as the rest of the shell. To meet this difficulty, it will be necessary to explain on what depends the regular variety of the colors of certain shells; the same

experiments will lead to the discovery of the cause of the one, and will serve to unfold the other.

This remarkable variety of color is in no shell more remarkable than in the *Helix nemoralis*. The ground of this shell is white, citron, or yellow, or a compound of different shades of these colors. Different colored rays are traced on this ground, turning spirally with the shell; in some they are black, in others brown, and sometimes reddish. The breadth of each of these rays gradually increases as they approach to the opening of the shell. It even sometimes happens, that two of these bands are so much extended in breadth, that they meet together and form one. Some individuals have five or six of these bands, while others have three or four, and even two, and sometimes only one. Others again have none at all, although of the same species; and among the individuals which are marked with colored bands, they are not always of the same breadth in the same parts of the shell; from which it appears, that no certain specific characters can be derived from the color, since it is subject to so much variety. According to Reaumur, the viscid and earthy matter of which the shell is composed, is secreted from the surface of the animal's body; but in certain places of the surface, particles which produce a different color are separated; and whether this depends on a peculiar organization of those places, or on the form of the particles themselves, it appears that these particles, either of a different nature, or of a different figure, by uniting, form bodies which reflect different rays of light; that is to say, form parts of the shell of different colors.

This seems to be a necessary consequence of the mode in which the growth of shells is accomplished. The whole external layer of the shell is formed by the neck of the animal, because it is that part which is nearest to the head, and consequently as the animal increases in size, that part ceases to be covered with the old shell. It therefore depends on this part of the animal to extend the shell, and for this purpose it is sufficient that the neck be furnished with glands for secreting the different fluids, to form a shell of different colors. If, for instance, there are two or three glandular bodies which secrete brown or blackish particles, and that these glandular bodies are disposed in a parallel direction to each other, while the glands on the rest of the surface only secrete particles of matter which reflect the light of a citron color, the shell formed by these bodies will have a citron ground, with black or brown bands, nearly parallel, or which gradually approach to each other, and become larger in the same proportion as the external organs of the animal increase in size.

If no such glandular structure, or difference in the matter secreted, should be traced on the neck of the *Helix nemoralis* this explanation of the cause of the variety of colors in shells would appear extremely probable; but this probability amounts to certainty, from the actual observation of the existence of this peculiarity of structure and effect. When the *Helix nemoralis* is deprived of part of its shell, the body appears of a white color, excepting towards the neck, where the white inclines to yellow, and where besides there is a number of black or brown bands, equal to that of the bands of the shell, and arranged in the same direction. It has been observed, too, that the individuals which have only one black stripe on the shell, have only one single black spot on the neck; and those having four spots on the neck, have four stripes of the same color on the shell. These rays are placed immediately under those of the shell; they commence at the distance of about a line from the extremity of the neck, which is itself usually spotted with black all round. The existence, therefore, of these excretory organs can no longer be doubted. The difference of color seems to prove the difference of structure. But to establish this beyond the possibility of doubt, it is only necessary to have recourse to experiment, by observing what happens in the new piece of shell which is renewed, in place of that portion which has been removed, and if it appear that the part of the shell which is formed opposite to the black rays of the animal, is black, and if that which is formed between the stripes, be of a different color from that of the stripes themselves on the rest of the body, no farther proof can be required. Now, it has been observed, that the part of the new shell formed on the neck opposite to the black or brown stripes on the animal's body, is itself black or brown; that formed between the stripes is white or citron, while the rest of the body is white, but different from that of the neck, when it is of this color.

It sometimes happens, that the part of the shell which has been renewed is of a different color. This apparent deviation will appear less difficult to be reconciled to the explanation of the process which has now been given, if we attend to the circumstance that the new shell formed opposite to the neck of the animal is never different from that of the old shell, excepting that the external surface is extremely rough, and presents numerous furrows or groovs, in place of the smoothness and fine polish of the old shell. In this case, the inequality of surface is occasioned by the motion of the animal retiring within its shell, before the new piece has acquired sufficient consistency and solidity; and thus the new shell, having contracted on its surface wrinkles or furrows, the

light is very differently reflected. But there is another cause for this difference of color in these circumstances. When a large piece of shell is removed, the first layer which is formed is usually white. The particles of the fluid which are necessary for the formation of the shell of this color, seem to be more easily excreted from the surface of the body, than the particles of fluid which go to the formation of any other color. It is observed that the body of the animal is covered with this fluid long before there is any appearance of secretion about the neck. This liquid is extended to the neck, and this produces a new layer of white shell; but as this layer is extremely thin and transparent, it does not prevent the usual secretion of the coloring matter at the neck to appear. In this period of the process if the animal retire within its shell, the new layer, still adhering in many points to its body, and not having acquired sufficient solidity, will be distorted and wrinkled; and not only exhibit that inequality of surface which generally appears in shells thus formed, but this arrangement of stripes or colors will also be destroyed.

It would be a very false conclusion from this account of the mode of the formation of the stripes which appear on certain species of shells, that the external surface of all shells should be marked with colors, or should be uniformly of the same color; and that there should be no shells whose external surface is marked with different spots, differently arranged, of an irregular figure, and separated from each other by unequal intervals. For if it has been shown that these colors are produced on the surface of the shell, only by means of the secretory organs, situated on the neck of the animal, it cannot be supposed that the same effects will follow, unless the animal is placed in the same circumstances. These secretory organs, therefore, must exist during the entire formation of the shell, to furnish the same quantity of coloring matter during the whole of its progress. But if it happen, on the contrary, that these organs undergo any change; if the pores through which the liquid is poured to form a shell or part of a shell of a brown color, become too large or too small, or in other respects change their form, after having poured out a certain quantity of this fluid; and that those which furnish the fluid of which the white part of the shell is composed, are also changed, it must happen that the shell which is produced is marked with different black and white spots, combined with a degree of irregularity corresponding to the change on the secretory organs. This will appear to be the case, by attending to the changes which take place in the secretory organs of snails which produce colored shells; for in them it may be observed, that the colors are dis-

tinct and well marked in some, towards the opening, while they are scarcely perceptible on the first turn of the spire towards the tip of the shell; and these changes of color cannot be supposed to exist without a corresponding change on the secretory organs.

The fluidity of the liquid for the formation of the shell has probably also some effect in the regular distribution of the colors which appear in some species. It is easy to imagine that some animals may secrete a fluid for the formation of the shell, of such a degree of fluidity as to flow easily from one place to another, and thus produce irregular marks on the shell. But besides, if there are secretory organs situated on the neck of the animal, which prepare fluids of different colors; if the animal moves, or is disturbed by any means, when these fluids are excreted on the surface, the colors will appear in a different place from their original distribution, or to be mixed and blended together, and thus occasion that irregularity which is observed in those parts of shells which have been last produced, or renewed.

But it will be necessary to have recourse to the first of these causes, namely, to the change of structure in the secretory organs of the neck, to explain the regular distribution of the round spots, or of those of a square or rectangular figure, with which certain shells are marked, and to suppose that those vessels which are arranged in a square or rectangular manner, which furnish peculiar fluids, are shut or open at different periods. It may happen that the developement of a great part of the animal, occasioned by a more vigorous growth in certain species than in others, may, in some cases, be the only cause of those regular spots, sometimes white on a colored ground, and sometimes colored on a white ground, which the shell exhibits, if the glands which secrete the coloring matter correspond in their distribution, to that of the divisions on the shell, and if they occupy a greater space on the neck than is usual in other species. In this way may be accounted for, the regularity of those marks, and the increase of their size, which is usually proportioned to that of the turns of the spire, from the consideration of the secretory organs of the animal enlarging in the same proportion as the other parts of its body; and their effects in the formation of the shell corresponding to the developement of those parts. Hence it follows, that the largest marks are observed on the external convolutions of the shell.

According to Reaumur, the last layer of the shell which is formed from a fluid secreted from that part of the surface of the animal's body which does not reach the neck, should be white, and this is most generally the case. In those shells which are inter-

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nally colored, the fluids secreted from the body of the animal are of the same color, and they take the place of those which are usually white, or of a pearly nature, as is observed in many others. The nature of these internal layers is always obvious; for if they are not white, they exhibit everywhere an uniform color, and never variegated, like what appears externally. By removing with a file any part of the external surface of the shell, the layers which appear immediately under the surface, as those which have been furnished by the body of the animal, while those on the surface itself, usually more variegated than the rest, owe their formation to the vessels about the neck, and have been formed in the way already described.

The growth of shells, being proportioned to that of the inhabitant, proceeds almost imperceptibly. In most shells, however, it is easy to distinguish the different additions which they have received; for they are marked on their convex surface with different eminences which are parallel to each other, similar to lines of different degrees of depth, which give the shells a fibrous structure. These elevations called *striæ*, may be traced through the whole of the shell in bivalves, and in the longitudinal direction of those which have a spiral form. From the slightest observation of the manner in which shells are formed, it is easy to see that they can receive no addition, without leaving, in a greater or less degree, some trace of these irregularities; for every small addition of testaceous matter which is made, must be attached to the old part of the shell, which consequently must be more elevated than the former, whatever be its thickness, when the enlargement of the animal requires the formation of the latter. Thus the shell will be marked with a great number of these striæ, parallel to each other, which may be distinctly seen on many different species.

Every shell has usually some of these eminences at greater distances, and more elevated than the others. By these the different periods when the shell ceased to increase, or rather those when its growth was interrupted, are marked; and they have some degree of analogy with the different shoots from the branch of a tree. The heat of summer or the cold of winter interrupting the growth of the animal, at least among such as are testaceous, which live on the land, or inhabit rivers in temperate regions, the shell is not enlarged in extent during these seasons. It is otherwise, however with regard to its thickness, for there is continually exuded from the body of the animal, small quantities of fluid, which increase its thickness. Hence it is when the shell begins to increase in extent, the edge to which the new portion is cemented,

is much thicker than when the growth was gradual and imperceptible, and consequently the place at which the growth commences, after a long interruption, is distinguished by a more elevated ridge, than in the continual progressive additions which it receives. The numerous instances of this interruption in the growth of shells, will occur to the attentive conchologist in the progress of his researches. We know of a cabinet containing a fine illustration of the same thing, in a specimen of *Murex ramosus*. The animal, it would appear from the original part of the shell, had been for some time in a sickly or unhealthy state; for it has undergone many of the changes to which dead shells are subject. It has lost its enamel; it seems to have undergone some degree of decomposition, and some species of *serpula* and other parsaitical animals had made it their abode; but from this sickly state it seems to have recovered, and acquired great vigor; for the next addition which is made to the shell, is equal to its original bulk. It is clean, entire and in perfect preservation, forming a singular contrast with the old shell.

The place at which shells begin to increase, after the growth has been for some time interrupted may be distinguished by a difference of color in the stripes with which the shell is usually marked. In these places, black or brown stripes exhibit more vivid colors, and sometimes even little different from those on the rest of the superior surface of the shell. The cause of this change is not difficult to trace if we recollect that the secretory organs which prepare the coloring matter, at least in the *Helix nemoralis* have their origin at some distance from the extremity of the neck, from which we have seen that the first layer of shell which is traced to the extremity itself, should be of a different color from that of the stripes; but as the increase of the animal occasions the stripes to be formed under this first shell, during which it is still very thin, and consequently transparent, it does not prevent the shell produced under it, of a black color, to appear so. But when the animal has ceased to grow for sometime, it then increases the thickness of the shell last formed, so that the shell which is next produced from the coloring matter, when the animal begins to grow, being laid on one part of the old shell much thicker and less transparent, the color of these stripes must appear less bright, and therefore different in those places, from the other parts of the shell.

In taking a review of what has been said concerning the production of the colors of shells, it must appear that these rays or colored lines are owing to glands which secrete the coloring fluid, and which are arranged on the anterior edge of the neck, while

the posterior part furnished only a fluid of a different color, and usually less deep than the first. By means of this principle it is not difficult to account for the arrangement of the different colors which are so splendidly exhibited among this class of natural objects. These colors may be reduced to one or more, which are more vivid on a lighter ground; to colored, circular bands on a ground of a less vivid color, or pure white; to longitudinal lines, round or square spots, and in a regular, or irregular zigzag form. All these may be easily explained, according to the principles which have been laid down, the application of which, from what has been said, will not, we hope, be found difficult.

But from this mode, which is the most general in the production of the colors of shells, there are certain deviations. In that division of shells which is made by some naturalists, and which is distinguished by the name of *porcelain shells*, on account of the fine enamel with which they are covered; there are two sets of colors, which are disposed in a parallel direction to each other. The external range of these colors is owing to a peculiarity of structure in the animals which inhabit them, different from that of other testaceous animals, and to an operation which does not take place in other shells. In these shells the coloring matter seems to be deposited in two different ways, and at two different periods. In the first process, when the body of the shell is formed, the coloring matter is excreted from the glands, in the same way as in other testaceous animals; and it is arranged according to the disposition of the glands on the body of the animals. At this period of the process the shell is only of a moderate thickness, and much less than what it afterwards acquires, when completely formed. On the external surface of the shell first formed, another layer is deposited, which is more compact than the first, in some places thicker, and usually variegated with different colors. The external surface of the shell being thus completely covered with this second layer, the original colors are concealed; and if the same shell were examined at different periods of its formation, it would appear like two distinct species. The organs which are employed by the animal in the production of this second layer of shell, and set of colors, are two soft, membranaceous wings, which being protruded from the opening of the shell, completely cover the whole of its external, convex surface. These two wings, which are quite distinct from the glandular structure about the neck of the animal, which is situated a little lower, are also provided with glands, which furnish coloring matter, usually different from that which is furnished by the glands of the neck and it is the upper surface of the wings, which is alone provided

with this glandular structure. This surface, when this part of the animal is protruded from the shell and extended over it, comes in contact with the external surface of the latter. Hence it is, that these membranaceous organs deposit on the first formed and colored layers of the shell, new layers of testaceous matter, which is differently colored, and diversified with entire spots, either circular or in a waved direction, which are sometimes of a more vivid tint than that of the ground, or white upon a dark ground, or brown upon a yellow ground; or are composed of straight lines, or curved or interlaced with each other, reddish brown, yellow or white; on different colored grounds, or in dots or points, whose shades and arrangement are not less diversified.

This mode of the formation of the external layer of porcelain shells, has been proved by the actual observations of some naturalists. In some species, a longitudinal line of a paler color is observed on the convex surface of the shell. This is ascribed to the junction of the two wings of the animal, where a smaller quantity of coloring matter has been deposited, or where the shell has been less completely covered with the protruded part of the animal. But the existence of this second layer is still more distinctly proved by mechanical means.

The external layer may be removed by means of a file, and the shell restored to its original state; and then the colors which it first received are brought into view. This circumstance is still farther demonstrated by an attentive examination of different species of shells, and particularly the *Cypræa argus*. In examining this shell, there are observed under the external layer, which is of a yellow color, some slight traces of four transverse bands of a brown color, which surround the shell, and which must have been formed previous to the more superficial yellow layer. By a more minute examination, it will appear that the circular spots, with which the external yellow layer is marked, have been posteriorly formed to this layer; and finally, on the four turns of the spire forming a slight projection at the base of the shell, there are some brown, circular spots, which are quite superficial, and which sometimes include two turns of the spire, which could not happen if the yellow color had not been prior in its formation to these circular spots. If the coloring matter of which these spots are composed had been deposited at the time that the different parts of the spire were formed, one spot could not have included two turns of the spire at the same time.

This effect of communicating a new set of colors to the external surface of the shell, is not the only one which is produced by the membranaceous structure of the animal which inhabits the

porcelain and other shells. The form of the shell is also changed in a remarkable manner, a great quantity of testaceous matter being deposited on the surface of the opening, which then assumes a considerable thickness. The turns of the spire are incrusted, and sometimes disappear on the outside of the shell; and wrinkles, furrows, and even tubercles, which exist on the surface of some species, are also formed. The surface of the *Cypræa pediculus* exhibits circular striæ which did not originally exist, which owe their formation to this cause. In other species, the surface is marked with projecting points or tubercles, which are produced in the same manner as the circular striæ of the former, and which also depend on the structure of the membranaceous wings of the animal and the testaceous substance which is secreted and deposited from their surface. Thus, it appears that porcelain shells, and those of some other species, are formed at two distinct periods. It is during the second period of the process that the color of the complete shell is formed. In farther illustration of this point, of the formation of shells of this description at two different periods, one or two examples may be given of the difference which takes place, when the last layer formed is removed. In the *Cypræa exanthema*, the shell is ferrugineous, with whitish, round spots and eyes, but when the outer coat is worn off, it becomes barred or tessalated with brown or blue. The *Cypræa arabica*, as its name imports, exhibits characters on its surface, having some resemblance to Arabic letters. The ground on which these characters, which are of a brown color are placed, is whitish or bluish; yet when the outer coat is worn down, the shell is sometimes marked with blue or brown bands, or pale with darker angular spots and lines; brown, mixed with violet, or reddish blue.

But besides the causes which have been mentioned concerning the production and variety of the colors of shells, arising from the difference of structures in the organs which secrete the coloring matter, and the changes to which these organs are subjected in the growth of the animal, the effects of light and heat, altogether independent of the animal itself, are probably very considerable. Two individuals of the same species, the one from the Mediterranean or European seas, and the other from the tropical regions, exhibit very different shades of colors. The colors of the inhabitants of the torrid zone are always more bright and vivid than those of the natives of more temperate climates. The two shells, although similar in form, size and other characters are uniformly different in the intensity of their colors. These differences, which have led conchologists to increase the number of species, obviously depend on the action of the climate, and particularly of light, on nourish-

ment, and other circumstances which have hitherto eluded the observation of naturalists, and are uniform and constant, as long as the causes which operate in their production, continue to act. At first sight it might be supposed that the difference of temperature is the difference in the intensity or color, in shells produced in different climates. It might be supposed too, that the different depths at which shells are found in the ocean, the medium in which they live being thus very different, would occasion great diversity in color. Near the surface, where the heat is greatest, if the operation of this cause were considerable, the colors of shells should be expected to be most vivid, and as the depth increased, at least to a certain extent, the intensity of color should be diminished. But it has been observed in bivalve shells which are found at great depths, such as some species of oyster and spondylus, that the lower valve, which is attached to the rock, is almost always white or colorless, while the upper valve often exhibits bright and vivid colors; but this difference cannot be ascribed to the difference of temperature, for in both valves it must be the same as the matter secreted, for their formation is prepared by the same organs, and is deposited in a similar manner; and indeed they are altogether placed in the same circumstances, and the same causes, excepting that the upper valve is exposed to the rays of light, and is therefore colored, while the lower valve is removed from the action of this cause, and is colorless.

The same difference is observed in the valves of other shells, which are produced in similar circumstances. The different species of pholas which make their abode in calcareous or coral rocks, and the *Teredo navalis* or ship worm, which pierces wood, and makes it its habitation, are usually colorless. Those testaceous animals too, which live at great depths in the ocean, and are thus far removed from the influence of light, are also distinguished by very white colors, or are entirely white.

ORNITHOLOGY.

NO. VI.

Incubation. It is probable birds are endowed with an instinctive power of regulating the necessary heat for this purpose; of course, should the heat of the air, together with the natural warmth of the body, on the close contact of the bird to the eggs, be too

great, her feelings would dictate the necessity of leaving them for a time to cool. At the early period of incubation birds quit their eggs more frequently than at the time the *fœtus* is more perfect. Yet, in the advanced state, the embryo young is not in more danger of being destroyed, if so much; for a living fœtus is frequently found that has been taken from the nest two days. If, however, the young is within a few hours excluded, and the egg is suffered to be sometime cold, it either dies, or becomes so weak, as not to be able to extricate itself from the shell. Various degrees of heat will enlarge the embryo young, but regular heat seems necessary to its production; and yet artificial heat, regulated by the brooding of a bird, will not produce young with certainty. In Egypt, a vast quantity of eggs are hatched by artificial heat in stoves. It is probable, however, one third or one fourth miscarry.

The male birds of some species supply the place ofthe females on the nest; but then it is of short duration, and rarely, if ever, when eggs are near hatching: at that time the female is frequently fed by the male. This is not common to all species, but very conspicuous in the rook, the pigeon and many others. Many species of birds possess a *reservoir* for food, called a *craw*, or *crop;* this seems to answer the same purpose as the first *stomach* in ruminating animals. Here it is the food is softened and prepared for the stomach; from this reservoir it is by some ejected for the purpose of feeding their young; conspicuous in the pigeon.

The rook has a small pouch under the tongue, in which it carries food to its young. It is probable the use of the craw may be extended further than is generally imagined; for, besides the common preparation of the food to assist its digestion in the stomach, there are some species that actually secrete a lacteal substance in the breeding season, which, mixing with the half-digested food, is ejected to feed and nourish the young. The *mammæ*, from which this milky liquor is produced, are situated on each side of the upper part of the breast immediately under the craw. In the female turtle dove, these glands are tumid, with milky secretions, and we believe it common to both sexes of the dove genus. The comorant or pelican genus possess no craw; but to supply its place, they have a loose skin at the base of the under mandibles, capable of great distention, in which they carry fish to their young.

We shall conclude this article by givlng an account of Malpighi and Haller's experiments on the hatching of a hen's egg.

Previous to putting the eggs to the hen, they first examined the cicatricula, which they considerde as the most important part of

egg. This, which some call the *punctum saliens*, or *punctum vitæ*, was found in those that were impregnated by the male to be large but in the others small. Upon examination with the microscope it was found to be a kind of bag, containing a transparent liquor in the midst of which the *embryo* was seen. The embryo resembled a composition of little threads, which the warmth of future incubations tended to enlarge.

Upon placing the egg in a proper warmth, after six hours the *vital speck* begins to dilate like the pupil of the eye. The head of the chicken is distinctly seen, with the back-bone something resembling a tadpole floating in its ambient fluid, but as yet seeming to assume none of the functions of animal life. About six hours more the little animal is seen more distinctly; the head becomes more plainly visible, and the vertebræ of the back more easily perceivable. All these signs of preparation for life are increased in six hours more; and, at the end of twenty-four, the ribs begin to take their places, the neck begins to lengthen, and the head to turn to one side.

At this time, the fluids in the egg, seem to have changed places; the yolk which was before in the centre of the shell, approaches nearer the broad end. The watery part of the white is diminished, the grosser part sinks to the small end; and the little animal appears to turn towards the part of the broad end in which a cavity has been described, and with its yolk seems to adhere to the membrane there.

At the end of forty hours the great work of life seems fairly begun, and the animal plainly appears to move; the back bone thickens; the first rudiments of the eyes begins to appear; the heart beats, and the blood begins already to circulate. The parts, however, as yet are fluid, but by degrees, become more and more tenacious. At the end of two days, the liquor in which the chicken swims, seems to increase; the head appears with two little bladders in place of eyes; the heart beats in the manner of every embryo where the blood does not circulate through the lungs. In about fourteen hours after this, the chicken is grown more strong; the veins and arteries begin to branch, in order to form the brains; and the spinal marrow is seen stretching along the back bone. In three days, the whole body of the chicken appears bent; the head with its two eye-balls, with their different humours, now distinctly appear; and five other vesicles are seen, which soon unite to form the rudiments of the brain. The outlines also of the thighs, and wings, begin to be seen, and the body begins to gather flesh. At the end of the fourth day, the vesicles that go to form the brain approach each other; the wings and

thighs appear more solid; the whole body is covered with a jelly like flesh; the heart that was hitherto exposed, is now covered up within the body, by a very thin transparent membrane; and at the same time, the umbilical vessels, that unite the animal to the yolk, now appear to come forth from the abdomen. After the fifth and sixth days the vessels of the brain begin to be covered over; the wings and the thighs lengthen; the belly is closed up, and turned; the liver is seen within it, very distinctly, not yet grown red, but of a dusky white; both the ventricles of the heart are discerned, as if they were two separate hearts, beating distinctly; the whole body of the animal is covered over, and the traces of the incipient feathers are already to be seen. The seventh day the head appears very large; the brain is entirely covered over; the bill begins to appear betwixt the eyes, and the wings, the thighs, and the legs, have acquired their perfect figure. Hitherto, however, the animal appears as if it had two bodies; the yolk is joined to it by the umbilical vessel that comes from the belly; and is furnished with its vessels, through which the blood circulates, as through the rest of the body of the chicken, making a bulk greater than that of the animal itself. But towards the end of incubation, the umbilical vessel shortens the yolk, and with it the intestines are thrust up into the body of the chicken by the action of the muscles of the belly, and the two bodies are thus formed into one. During this state, all the organs are found to perform their secretions; the bile is found to be separated, as in grown animals; but it is transparent, and without bitterness; the chicken then also appears to have lungs. On the tenth, the muscles of the wings appear, and the feathers begin to push out. On the eleventh, the heart which hitherto had appeared divided, begins to unite, the arteries which belong to it, join into it, like the fingers into the palm of the hand. All these appearances, come more into view, because the fluids the vessels had hitherto secreted, were more transparent; but as the colour of the fluids deepen, their operations and circulations are more distinctly seen. As the animal thus, by the eleventh day, completely formed, begins to gather strength, it becomes more uneasy in its situation, and exerts its animal powers with increasing force. For some time before it is able to break the shell in which it is imprisoned, it is heard to *chirrup*, receiving a *sufficient quantity of air for this purpose*, from that cavity which lies between the membrane and the shell, and which must contain air to resist the external pressure. At length upon the 20th day, in some birds sooner, and later in others, the enclosed animal breaks the shell within which it has been confined, with its beak; and by repeated efforts, at last procures its enlargement.

From this history we perceive, that those parts which are most conducive to life, are the first that are begun; the head and the back-bone, which no doubt enclose the brain, and the spinal marrow, though both are too limpid to be discerned, are the first that are seen to exist; the beating of the heart is seen soon after; the less noble parts seem to spring from these, the wings, thighs, the feet, and lastly the bill.

CABINET CYCLOPÆDIA.

SILK MANUFACTURE.

NO. VI.

'Gathering and sorting Cocoons. In either three or four days from the commencement of its labors the silkworm completes its cocoon, and in seven or eight days thereafter the balls are gathered. Some persons do not wait longer than three or four days ere they reap their silken harvest.

It is usual to begin by gathering from the lower tier of arbours. In this proceeding no violence should be used to disengage the twigs, which must be gently handled, and consigned to those whose employment it is to separate the cocoons. These persons, as they pick off the balls sort them; selecting those which are to be preserved for continuing the breed, and putting into distinct baskets all fine cocoons, those which are double, soiled, or anywise imperfect. The fine and well-formed balls are again subdived into white and yellow, the latter colour embracing every shade from the deepest yellow to those which are merely tinged. A very few will sometimes be found having a pale green hue. The cocoons of a bright yellow yield a greater weight of reeled silk than the others, but as their deeper colour results from the greater proportion of gum wherein the colouring matter principally resides, any advantage from this source accrues only to the grower, the gummy substance being all boiled out previous to the weaving of the silk.

'Raw silk which is of a pale colour is found to take certain dyes better, and is on that account very generally preferred.

'The selection of chrysalides for breeding is made from such cocoons as are perfectly sound, and whose threads appear to be fine; having their ends round and compact; and being a little de-

pressed in the middle, as if tightened by a ring or ligature. The reason given for attentions to these particulars, is the belief that worms producing such balls are of strongest constitutions. Count Dandolo was of opinion that too much stress is laid upon this point, and that all cocoons which are perfectly formed are alike desirable for breeding. For this purpose an equal number of males and females must be preserved. The former are distinguishable by being sharper at the ends, and this, although an unerring guide, proves sufficiently correct for all practical purposes. These cocoons are sometimes spread in thin layers on tables: but it seems a better practice, and one more generally adopted, is to string them together on a thread, care being taken not to pass the needle too deep into the silk. These strings, three or four feet in length, are then hung in festoons out of the reach of vermin. The floss is, in this case usually removed, as it is found to oppose additional difficulty to the moth in its extrication.

'In making the selection of cocoons for breeding, so as to insure the object of maintaining the number of his silkworms, the cultivator considers it necessary to set apart one sixtieth of his whole produce. This shows how considerable must be the loss sustained in this branch of the pursuit. If all the eggs produced by this proportion were found productive, the brood would by their means be trebled in the following season.

'The next proceeding is that of destroying the vitality of the chrysalides in those cocoons which are to be reeled. Various methods are employed for this purpose, according to the nature of the climate; the solar rays being in some instances found sufficient, no artificial means need then to be resorted to. In this case, a calm and cloudless day is chosen, and the cocoons are left exposed to the scorching beams of the sun, during four or five hours in the middle of the day. They are next closely inwrapt in coarse cloths which have been exposed to the same heat, black cloths being chosen preferably on account of their absorbing a greater quantum of heat. These processes being seperated during several days, the destruction of the insect is usually attained. It is not safe, however, without examination, to confide in its efficacy; for this trial a few chrysalides must be stripped and pricked with a needle. If upon this they give no sign of animation, it may be safely concluded that their suffocation has been perfected.

'In more temperate regions artificial means must necessarily be employed, and recourse is therefore had to the heat of steam, or of an oven; and most frequently the latter method is adopted, although there is no reason to doubt that the other, provided it could be efficaciously applied by means of convenient apparatus,

would be more quick and certain in its operation, as well as productive of less injury to the texture of the silk. When the oven is used, the cocoons are placed in long shallow baskets, filled to within an inch of their tops, and covered, first with paper, and then with a cloth wrapper. The heat of the oven wherein the baskets are disposed has not been more precisely defined, than that it should be *very nearly* that of an oven from which loaves of bread have just been taken after being baked. The worms are exposed to this heat during an hour; and on their being withdrawn, it is ascertained by the examination of chrysalides, taken from the centre of each basket, whether the vitality of the worms is destroyed. Those chosen for examination having been, from their position, the least exposed to the heat, it is fairly presumed that if these be dead the whole are equally destroyed. On their removal from the oven, the baskets are wrapped in woolen cloths or blankets, and piled on each other. If the baking has been properly conducted, the blankets will soon appear profusely covered with moisture, and if this should not be seen, the baking has been either excessive or insufficient. If too great, the worms and cocoons will have been previously so much dried as to leave no further moisture to transude; if too little, the heat has not sufficiently penetrated to distil the liquor which the chrysalides contain, and the worms, in that case, will not be deprived of vitality.

'It is obvious that very great nicety is required to limit the degree of heat to the exact point that will kill the chrysalides, and it is of great importance that this point shall not be exceeded, as the silken filaments would by such means be injured. For this reason steam would doubtless be much more frequently used, if any simple apparatus were introduced for the purpose. Where this agent is now employed, its efficiency is so limited that the operation is troublesome and the result uncertain.

'A large wooden vessel is provided, into which boiling water is poured to the depth of two feet. This vessel has within it a wicker hurdle, entirely covering the water, and supported about one inch distant from its surface. The bottom of this hurdle is provided with a coarse porous cloth, easily penetrable by steam: on this the cocoons are placed, and are covered well over to confine the heat. When the water has become so cool that it no longer emits a body of steam, it must be changed for other boiling water; and it is considered necessary to continue this steaming process for two hours, before the destruction of the chrysalides can be considered certain. If steam were differently applied, a few minutes would suffice for perfecting this object. The cocoons,

when removed from the steaming vessel, are covered over with the same care as is employed after baking, and they are left to cool very gradually. After this they are spread out in the air and sun to dissipate the moisture they have imbibed.

'It is always desirable, where time can be alloted to the purpose, that the process of reeling should be performed without the delay which renders this destruction of the worms necessary. This, in large establishments, is evidently impracticable as regards any very considerable proportion of the produce; but it must be always performable to a certain extent; and it is proper to give the preference, in this respect, to such cocoons as appear the weakest: the others, which contain a greater proportion of gum, are thence better qualified to sustain heat without injury.

'When the process, however conducted, for destroying the worms has been perfected, the cocoons are placed on shelves, and must be continually turned and looked over, lest they should become mouldy. If any appear spotted or otherwise damaged, they must be separated to prevent the injury spreading to those balls with which they are in contact, and should be immediately reeled to stay the progress of their own destruction. Large establishments for producing silk comprise in them buildings exclusively appropriated to this purpose, and which are called *coconieres*. These are rooms fitted up with ranges of shelves from two to three feet above each other, and the whole are insulated from the wall and roof, lest the place should be invaded by rats or mice, which would infallibly destroy the cocoons in their eagerness to reach the chrysalides, of which they are immoderately fond. Still farther to guard against this havoc, the legs of the framing which supports the shelves should be enveloped in some furzy or prickly substance.

'After the separation of cocoons for breeding, the gathering is divided into nine different qualities.

'*Good cocoons* are those which have been brought to perfection: these are by no means the largest, but are compact and free from spots.

'*Pointed cocoons* have one extremity rising in a point: these, after affording a little silk in reeling, break or tear at the point where the thread is weak, and they cannot be wound further, as their fracture would occur as often as the thread reached the weak point.

'*Cocalons* are rather larger than regular cocoons but do not contain more silk, their texture being less compact. These are separated from the other kinds, because in winding they must

be immersed in colder water, to avoid any furzing or entangling in the operation.

'*Dupions or double cocoons.* The threads of these are so intertwined, that frequent breakings occur in reeling, and sometimes they cannot be wound at all. In any parcel of cocoons the proportion of these will usually amount to one per cent.

Soufflons. These are very imperfect cocoons with a loose contexture, sometimes even to so great a degree as to be transpaent: these cannot be wound.

'*Perforated cocoons*, as their name denotes, have a hole in the end, and for that reason cannot be reeled, as the filament is found, to be broken whenever it arrives at the perforation.

'*Good choquettes* are concoons wherein the insects have died before perfecting their task. These are known by the adhesion of the worm to the cocoon, which prevents its rattling when shaken. The silk of these is as fine as of the first-mentioned quality, but not so strong nor so brilliant, and they must be wound separately, as they sometimes furze in reeling.

'*Bad choquettes* are defective cocoons, spotted or rotten. They furnish foul bad silk, and of a blackish color.

'*Calcined cocoons* are those wherein the worms after having completed their cells, are attacked by a peculiar disease, which sometimes petrifies them, and at other times reduces them to a white powder. In the former case they are called comfit cocoons from the resemblance which is borne by the withered worm to a sugar-plum. The quality of the silk, so far from being injured by this means, is generally excellent, and is even in greater quantity than in the cocoons of healthy worms. Comfit cocoons may be distinguished by the peculiar rattling noise of the worms when shaken: they are so much esteemed in Piedmont, that they sell for one half more than good cocoons. They are not of frequent occurrence, and it is very rarely that so large a parcel as twenty-five pounds is met with.

'The cocoons of the mountains are considered better than those produced on the plains: there is a greater proportion of white found among them; and although the balls are not so large, the worm is proportionally smaller than usual.

'The relative value of cocoons, as stated in the paper already quoted from the American Philosophical Transactions is as follows:—

Good Cocoons - - -	100
Perforated - - - -	33 1-3
Soufflons - - -	25
Royal cocoons, for seed - -	250
Royal cocoons, not chosen for seed	200

Cocoons lose in weight about seven and a half per cent. in the course of ten days by the desiccation of the chrysalis: to those, therefore who sell their cocoons previously to reeling, it is an advantage to dispose of them as soon as gathered. In one thousand ounces of perfect cocoons, the chrysalides weigh eight hundred and forty five ounces, the envelopes cast by the worms on becoming chrysalides four and a half, and the pure cocoon one hundred fifty and a half ounces. Thus each healthy cocoon, as it is gathered, contains more than the seventh part of pure cocoon; but the quantity of reeled silk obtained, seldom averages more than one twelfth in weight of the gathered cocoons. Mayet reckons, that if they are of superior quality, ten pounds of cocoons will produce one pound of silk; but that it more generally requires eleven or twelve pounds as gathered, to yield that quantity. The same author likewise estimates two hundred and fifty cocoons to weigh one pound: count Dandolo found that two hundred and forty of his made up that weight.

'If no loss be sustained either in hatching the eggs or in rearing the worms, it is possible to obtain from each ounce of eggs one hundred and sixty-five pounds' weight of cocoons: whatever less in weight is derived from this quantity of eggs indicates the exact amount of loss and damage sustained. In some parts of Italy, where the mode of management is very defective, only forty-five pounds of cocoons are obtained from each ounce of eggs: the average quantity is about one hundred pounds. Count Dandolo usually acquired on his establishment, from this weight of eggs, about one hundred and forty pounds of fine picked cocoons, in addition to the coarse floss with which they are surrounded.

'In the year 1790, the Society for the Encouragement of Arts, &c. adjudged their gold medal to Mr. Salvator Bertezen, for his having produced five pounds' weight of silk from worms reared in England. This gentleman professed to have a superior breed of worms, and that his manner of managing them was also better than that usually followed. The above quantity of silk, which was wound in seven to nine fibres, was said to be the produce of twelve thousand worms. This fact was much controverted at the time, and the quantity was deemed excessive with reference to the number of worms; but there now appears to be little reason for doubting its correctness, as the proportion very nearly agrees with the recorded experience of count Dandolo.

'This nobleman gives many elaborate calculations in his volume, the results of some of which may be found interesting. According to his experience, about ninety-seven and a half pounds of

mulberry leaves will suffice for the production of seven and a half pounds of cocoons: these will yield about eighteen ounces of pure cocoon, from which only ten ounces of reeled silk are generally obtained. Thus the proportion between the weight of mulberry leaves consumed, and that of the pure cocoon produced, is about eighty-seven to one; and the proportional weight of mulberry leaf and of reeled silk is as one hundred and fifty-two to one. The ratio between the quantity of reeled silk drawn from the cocoon and the cocoon itself, may be greatly affected by the good or ill management to which the worm is subjected.

In the year 1814, when the season was extremely unfavourable to the rearing of silkworms, the count obtained fifteen ounces of very fine silk from seven and a half pounds of cocoons, and thirteen ounces from the same weight of refuse cocoons. This fact speaks very highly for his excellent management. The proportion between the weight of silk which can be reeled, and the coarse floss which can only be spun, should, in perfect cocoons, be in the average ratio of nineteen to one. In addition to this proportion of refuse floss, there is likewise to be gathered the outer floss, which is a loose, furzy texture, spun by the worms preparatory to the formation of their balls: the nature of this substance, together with the injury that it sustains in its disengagement from the arbours, entirely prevent its being reeled. It is usually in the proportion of about four to eleven with the silk of the cocoon.

The weight and length of reeled silk that can be obtained from each cocoon are very variously stated by different authors: in fact, the quantity is found to vary considerably, depending on many circumstances attendant on its formation. Some statements on the subject have been extravagantly absurd. Among others, Isnard, an old author, who has been before quoted, and whose delight in the marvellous has, on this point, found rivals even in the present day, affirms that the silk of one cocoon, when drawn out, will measure six miles in length, that is ten thousand, five hundred and sixty yards! Count Dandolo, at once, contracts this measurement more within the limits of probability. He found that a silkworm's labours seldom exceed the production of six hundred and twenty-five yards;* an astonishing quantity, when we reflect upon the brief period employed by so small a creature in its production. Surely it is unnecessary to call in the aid of exaggeration more highly to excite our wonder.

Miss Rhodes of Yorkshire found that one of her largest cocoons measured four hundred and four yards. Pullein considers the

* 1760 French feet.

average to be three hundred yards. Miss Rhodes found that her cocoons weighed three grains each. Count Dandolo calculates the weight to be three eighty-four hundredths grains, equal to about three and a fourth English grains.

'The size of an ordinary cocoon of good quality is about an inch in its largest diameter, and one third less in its smallest diameter. The largest diameter of dupions is an inch and a quarter, and their smallest diameter three quarters of an inch.

'The attendance required for the care of silkworms does not wholly occupy the time of those employed, and it is, therefore, difficult to ascertain its amount with correctness. Pullein states, that for rearing the worms produced from six ounces of eggs two attendants are necessary until the fourth age, and that after this period five or six persons are required. Count Dandolo, with his accustomed accuracy, reduces the time required for attendance upon the produce of five ounces of eggs to an equality with one hundred days' continuous labour of one individual.

'From these data it is found, that to obtain one pound of reeled silk it requires twelve pounds of cocoons; that rather more than two thousand eight hundred worms are employed in forming these cocoons; and that to feed these during their caterpillar state, one hundred and fifty-two pounds of mulberry leaves must be gathered. This pound of reeled silk is capable of being converted into sixteen yards of gros de Naples of ordinary quality, or into fourteen yards of the best description.

'Experience has shown that some regulation of temperature is necessary in producing the moths from the cocoons. If the heat in which these are placed be above seventy-three degrees, their transition would be too rapid, and their productiveness would be lessened: on the other hand, if the temperature be below sixty-six degrees the developement of the moths is tardy, and their produce equally falls below the due proportion.

'The moths should begin to issue from their concealment in about fifteen days. The female deposits her eggs upon sheets of paper, or strips of linen, which are then hung in a cool situation, and when dry are preserved in an airy place, and securely shielded from damp and from vermin. In making choice of a situation wherein to store these eggs for the winter, although it is necessary to keep them cool, that premature hatching may be avoided, it is, on the other hand, indispensably requisite to preserve them from too intense a degree of cold: a temperature wherein water will freeze would be infallably destructive to their vitality.

THE BUTTERNUT.

Juglans cathartica.

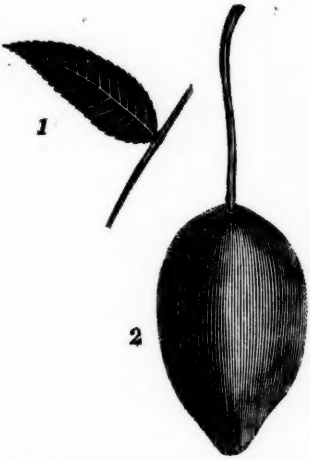
Fig. 1. A leaflet. Fig. 2. A nut with its husk.

This species of walnut is known in the United States, under different denominations. In Massachusetts, New Hampshire and Vermont, it bears the name of *Oil Nut*; in Pennsylvania and Maryland and on the banks of the Ohio, it is generally known by that of *White Walnut*; in Connecticut, New York, New Jersey, Virginia, and the mountainous districts of the upper parts of the Carolinas, it is called *Butternut*. The last of these names we have adopted, because it is most generally used. This tree is found in the Canadas, in all of the New England States, New York, New Jersey, Kentucky, Tennessee and on the banks of the Missouri, and in the bottoms which border on the Ohio. It flourishes most abundantly in a cold unproductive soil, interspersed with large rocks, and on the steep, elevated banks of rivers.

In favorable situations this tree grows to the height of fifty or sixty feet with a circumference of ten or twelve feet, five feet from the ground. Its roots extend even with the surface of the earth, in a serpentine direction, and with little variation in size, to the distance of forty feet. The trunk ramifies at a small height, and the branches, seeking a direction more horizontal than those of other trees, and spreading widely, form a large and tufted head, which gives the tree a remarkable appearance. The bark of the secondary branches is smooth and grayish. The buds, like those of the black walnut, are uncovered. In spring its vegetation is forward, and its leaves unfold a fortnight earlier than those of the hickories. Each leaf is composed of seven or eight pair of sessile leaflets, and terminated by a petiolated odd one. The leaflets are from two to three inches in length, lanceolate, serrate and slightly downy. The barren flowers stand on large cylindrical aments, which are single, four or five inches long, and attach-

ed to the shoots of the preceeding year; the fertile flowers, on the contrary, come out on the shoots of the same spring, and are situated at the extremity. The ovarium is crowned by two rose-colored stigmas. The fruit is commonly single, and suspended by a thin, pliable peduncle, about three inches in length; its form is oblong-oval without any appearance of seam. It is often two and a half inches in length, and five inches in circumference, and is covered with a viscid adhesive substance, composed of small transparent vesicles, which are easily discerned with the aid of a lens. The nuts are hard, oblong, rounded at the base, and terminated at the summit, in an acute point; the surface is very rough, and deeply and irregularly furrowed. They are ripe from the middle to the end of September, a fortnight earlier than the other species of walnut. The kernel is thick and oily, and soon becomes rancid; hence, doubtless, are derived the names of *Oil nut* and *Butternut.*

The black walnut and butternut, when young, resemble each other in their foliage, and in the rapidity of their growth; but when arrived at maturity, their forms are so different, as to be distinguishable at first sight. Remarkable peculiarities are also found, on examining their wood, especially when seasoned; the black walnut is heavy, strong, and of a dark brown color; while the butternut is light, of little strength, and of a reddish hue; but they possess in common, the great advantage of durability, and of being secure from the annoyance of worms. From its want of solidity and from the difficulty of procuring pieces of considerable length, the timber of the butternut is seldom used in the construction of houses. As it long resists the effects of heat and moisture, it is esteemed for the posts and rails of rural fence. For corn shovels and wooden dishes, it is preferred to the red-flowering maple, because it is lighter and less liable to split. In Vermont, it is used for the panels of coaches and chaises; the workmen find it excellently adapted to this object, not only from its lightness, but because it is not liable to split, and receives paint in a superior manner.

The medicinal properties of the butternut bark, have long since been proved, by several eminent physicians of the United States. An extract in water, or even a decoction sweetened with honey, is acknowledged to be one of the best cathartics afforded by *materia medica*; its purgative operation is always sure, and unattended, in the most delicate constitutions, with pain or irritation. Experience has shown that it produces the best effects in many cases of dysentery. It is commonly given in the form of pills, and to adults, in doses from half a dram to a dram. It is not however in

general use, except in the country. It is obtained by boiling the bark entire in water, till the liquid is reduced by evaporation, to a thick, viscid substance, which is almost black. This is a faulty process; the exterior bark, or the dead part which covers the cellular integument, should first be taken off, for by continued boiling, it becomes charged with four-fifths of the liquid, already enriched with extractive matter. This bark is also successfully employed as a revulsive, in inflamatory ophthalmias and in the tooth ache: a piece of it soaked in warm water, is applied in these cases to the back of the neck. In the country it is sometimes employed for dying wool of a dark brown color; but the bark of the black walnut is preferable. On a live tree, the celcular integument, when first exposed, is of a pure white, in a moment it changes to a beautiful lemon color, and soon after to a deep brown. If the trunk of this tree is pierced in the month which precedes the unfolding of the leaves, a pretty copious discharge ensues of sugary sap, from which, by evaporation, sugar is slightly obtained inferior to that of the sugar maple. *Sylva Americana.*

THE CHERRY TREE.

This tree was procured and brought into Europe by the overthrow of Mithridates, king of Pontus, when he was driven from his dominions by Lucullus, the Roman general, who found the cherry tree growing in Carasus, a city of Pontus, now called Keresoun, a maratime town belonging to the Turks in Asia, which his army destroyed, and from whence it derived the present name of *cherry*. Lucullus, who was as great an admirer of nature as he was of the arts, thought his tree of so much importance, that when he was granted a triumph, it was placed in the most conspicuous situation among the royal treasures which he obtained from the sacking of the Capitol of Armenia; and we doubt much if there was a more valuable acquisition made to Rome by that war, which is stated by Plutarch to have cost the Armenians one hundred and fifty-five thousand men: we may justly style it the fruit of the Mithridatic war.

Botany seems to have been as much studied in early times by distinguished persons as at present. In this instance we find the conquered and the conqueror both botanists. Mithridates, whom Cicero considered the greatest monarch that ever set on a throne, and who had vanquished twenty-four nations whose different lan-

guages he had learned, and spoke with the same ease and fluency as his own, found time to write a treatise on botany in the Greek language. His skill in physic is well known; there is even at this day, a celebrated antidote, called Mithridate.

It was in the 68th year, B. C. that Lucullus planted the cherry tree in Italy, which 'was so well stocked,' says Pliny, 'that in less than twenty-six years after, other lands had cherries, even as far as Britain beyond the Ocean.'

Some idea may be formed of the Roman gardens, by the luxurious manner in which Lucullus lived in his retirement from Rome and the public affairs. He had passages dug under the hills, on the coast of Campania, to convey the sea water to his house and pleasure grounds, where the fishes flocked in such abundance, that what were found at his death sold for more than eight hundred thousand dollars. Pliny mentions eight kinds of cherries as being cultivated in Italy, when he wrote his Natural History, which was A. D. 70. 'The reddest cherries,' says he, 'are called *apronia;* the blackest, *actia;* the Cæcilian are round. The Julian cherries have a pleasant taste, but are so tender that they must be eaten when gathered, as they will not endure carriage.' The Duracine cherries were esteemed the best, but in Picardy the Portuguese cherries were most admired. The Macedonian cherries grew on dwarf trees; and one kind is mentioned by the above author, which never appeared ripe, having a hue between green, red and black. He mentions a cherry that was grafted, in his time on a bay tree stock, which circumstance gave it the name of *laurea;* this cherry is described as having an agreeable bitterness. 'The cherry tree could never be made to grow in Egypt,' continues Pliny, 'with all the care and attention of man.'

Lord Bacon has clearly elucidated what the ancients considered the sympathy or antipathy of plants. 'For it is thus,' says this great man, 'wheresoever one plant draweth such a particular juice out of the earth, as it qualifieth the earth, so that juice which remaineth is fit for the other plant; there the neighborhood doeth good, because the nourishments are contrary or several; but where two plants draw much the same juice, then the neighborhood hurteth; for the one deceiveth the other.

The cherry, like many other kinds of fruit has had its sorts so multiplied, by various graftings and sowing the seeds, that we now enjoy a great variety of this agreeable fruit, and for a considerable portion of the summer, as it is one of the first trees that yields its fruit, in return for the care of the gardener. From the ripening of the Kentish and the May Duke to the Yellow Spanish and the Morells, we may reckon full one third of the year that our

desserts are furnished with this ornamental fruit; and to those who have the advantage of housed trees, the cherry makes a much earlier appearance, as it is a fruit that bears forcing exceedingly well.

Cherries have ever been found more tempting than wholesome. Pliny says, 'this fruit will loosen and hurt the stomach; but when hung up and dried, has a contrary effect. He relates, that some authors have affirmed that cherries, eaten fresh from the tree when the morning dew is on them, and the stones being also swallowed, will purge effectually, as to cure those who have the gout in their feet.

The wood of the cherry tree, which is hard and tough, is next to oak for strength, and comes the nearest to mahogany in appearance.

Judiciously planted, the cherry tree is very ornamental in the shrubbery. Its early white blossoms are contrasted with the sombre shades of evergreens in the spring; and its graceful ruby balls give a pleasing variety in the summer.

East Indian Method of Making Ice.

Ice, in the East Indies, is considered so great a luxury, that the manufacture of it is a business of considerable consequence, as well as profit.

The workmen dig several large pits, perhaps thirty feet square, and about two deep,—the bottoms of which, they cover from eight inches to a foot thick with sugar cane, or the stems of the large Indian corn, dried.

On this bed are placed, in rows, a number of small shallow, unglazed earthen pans, formed of a very porous earth, a quarter of an inch thick, and about an inch and a quarter deep, which, at evening are filled with soft water, which has first been boiled.—In the morning, before sunrise, the ice makers attend at the pits, and collect what is frozen, in baskets, which is then conveyed to the place of preservation. This is generally prepared on some high and dry situation, by sinking a pit, nearly fifteen feet deep, which is lined with straw, first, and afterward with a second lining of coarse blanketing. The ice is deposited here, and beaten down with hammers, till, at length, its own accumulated and accumulating cold, again freezes the whole mass into a solid cake. The mouth of the store-pit is well secured from the influence of exterior air, with straw and blankets, and lastly, a thatched roof is thrown over the whole.

METEOROLOGICAL JOURNAL,

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[From the Daily Advertiser.]

	THERMOMETER.			BAROMETER.			FACES OF THE SKY.			DIRECTION OF WINDS.			RAIN.
Day.	*Morn.*	*Noon.*	*Even.*	*Morn.*	*Noon.*	*Even.*	*Morn.*	*Noon.*	*Even.*	*Morn.*	*Noon.*	*Even.*	*Inch.*
1	42	58	39	29.74	29.72	29.70	Fair	Fair	Fair	W.	S. W.	W.	
2	32	45	36	29.85	29.94	30.00	Fair	Fair	Fair	N. W.	N. W.	N. W.	
3	36	35	35	29.88	29.62	29.56	Cloudy	Rain	Fair	S. E.	S. E.	N. W.	.52
4	27	42	32	29.82	29.82	29.75	Fair	Fair	Fair	N. W.	N. W.	W.	
5	26	33	28	29.92	30.10	30.20	Fair	Fair	Fair	N. W.	N. W.	N. W.	
6	24	38	28	30.37	30.37	30.40	Fair	Fair	Fair	N. W.	N. W.	E.	
7	26	42	33	30.32	30.27	30.13	Fair	Fair	Fair	S. W	E.	E.	
8	32	37	28	30.11	30.12	30.19	Fair	Fair	Fair	N. E.	N,	N.	
9	23	32	27	30.20	30.32	30.32	Fair	Fair	Fair	N. W.	E.	S. W.	
10	28	42	38	30.25	30.18	30.12	Fair	Fair	Fair	S. W.	S. W.	S. W.	
11	38	51	38	30.00	30.00	30.01	Rain	Fair	Fair	S. W.	N. W.	S. W.	.19
12	34	65	55	30.00	29.92	29.88	Fair	Fair	Fair	N. E.	S. W.	S. W.	
13	60	71	62	29.84	29.82	29.80	Fair	Fair	Fair	W.	E.	N. E.	
14	38	43	36	29.80	29.80	29.92	Fair	Cloudy	Rain	N. E.	N. E.	N. E.	.04
15	36	40	38	29.98	30.00	30.08	Cloudy	Fair	Fair	N. E.	N. E.	N. E.	
16	35	39	36	30.04	30.08	30.05	Fair	Cloudy	Rain	N. E.	N. E.	N. E.	
17	37	38	38	29.95	29.99	29.99	Rain	Rain	Rain	N. E.	N. E.	N. E.	
18	34	36	34	29.99	30.02	29.99	Rain	Rain	Rain	N. E.	N. E.	N. E.	2.40
19	35	38	33	29.95	29.95	29.90	Rain	Rain	Rain	N. E.	N. E.	N. E.	
20	34	36	34	29.89	29.92	29.93	Cloudy	Rain	Cloudy	N. E.	N. E.	N. E.	.21
21	35	48	46	29.92	29.90	29.84	Fair	Fair	Fair	N. W.	E.	N. W.	
22	40	48	36	29.98	30.05	30.10	Fair	Fair	Fair	N. W.	N. W.	N. W.	
23	30	38	32	30.20	30.29	30.15	Fair	Fair	Fair	N. W.	E.	S. W.	
24	36	43	37	30.05	30.10	30.20	Fair	Fair	Fair	N. W.	N. W.	N. W.	
25	36	59	53	30.19	30.05	29.94	Fair	Fair	Fair	S. W.	S. W.	S. W.	
26	56	76	62	29.83	29.72	29.70	Fair	Fair	Cloudy	S. W.	S. W.	S. W.	
27	62	74	50	30.73	30.82	30.04	Fair	Fair	Fair	S. W.	N. W.	N. E.	
28	40	42	37	30.15	30.20	30.22	Cloudy	Rain	Fair	N. E.	N. E.	N. E.	.12
29	37	42	40	30.23	30.23	30.21	Cloudy	Cloudy	Rain	N. E.	N. E.	N. E.	
30	40	44	42	30.21	30.21	30.15	Rain	Rain	Fair	N. E.	N. E.	N. E.	.46
													3,94

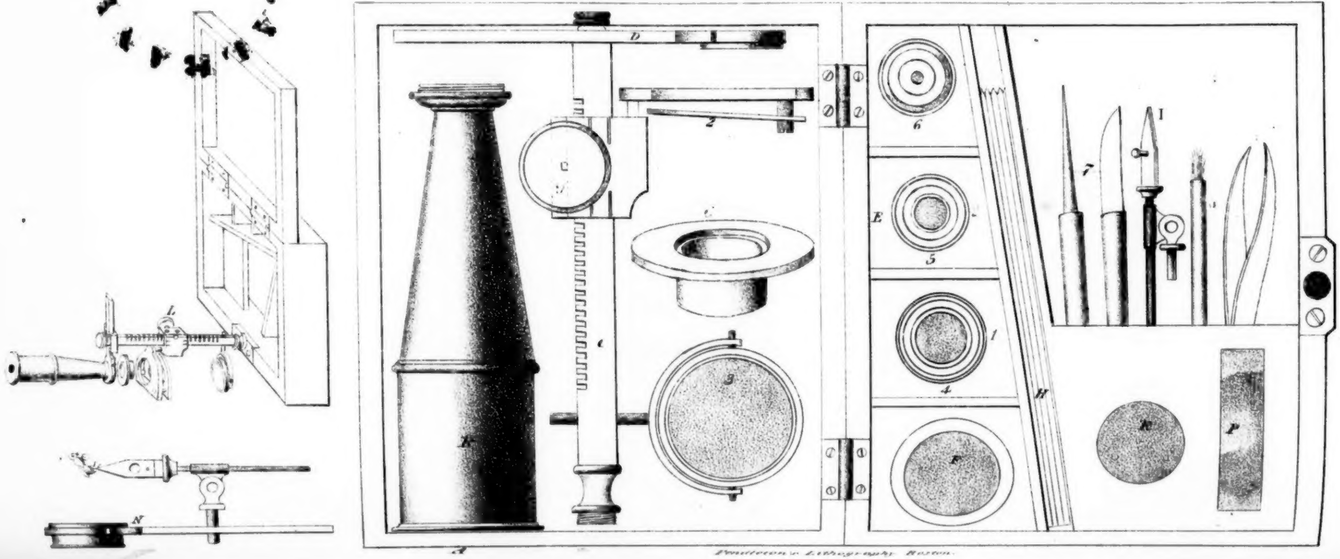
Depth of rain fallen 3.94 inches.

Hours of observation, at sunrise, 1 o'clock, and 10 P. M.

Gould's Improved Pocket Compound Microscope.

Answering the purpose of the Single Compound, Opaque & Aquatic Microscope Shuts in a Case 3 in.s by 2½ the size of the Drawing with a Magnifying power of 26400 times.

Pl. 7



Pendleton's Lithography Boston.